Table 2.

T_1 (°C)	t_1 (min.)	T_2 (°C)	t_2 (min.)	T_0-T_2 (°C)	t_0 (min.)	Temp. Change (°C)
260	8	225	3	7	15	±1
ditto	7	226	4	6	15	ditto
ditto	9	225	3	7	10	ditto
ditto	7	230	2	2	60	ditto
ditto	6	231	1	1	80	ditto
ditto	7	231	1	1	90	ditto
ditto	8	230	1	2	40	ditto

T_1: Melting temp.; T_2: Supercooling temp.; T_0: Melting point; t_1: Time from melting temp. to melting point; t_2: Time from melting point to supercooling temp.; t_0: Time of supercooling.

Table 3.

Electrolysis Solution	Perchlorc Acid: 19.4% Acetic Anhydride: 80.6%
Current Density	0.75 A/cm^2.
Time	0.5~1 min.

These electropoliched seeds were immersed into the liquid tin which was supercooled at 2°C below the melting point of tin, from both the room temperature and the supercooling temperature. The growth of seed was partially observed in the former but not in the latter, probably due to the formation of oxide on the surface of seed.

From the experimental results of (1) and (2) above mentioned, it was found that the method adopted in this experiment was unsuitable to accomplish our aim when operated in air but should be operated in vacuum.

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7. Study on Surface Electricity. (XVI)

On the Theory of U-effect —— Continued

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As was already mentioned before, U-effect II is a phenomenon based on the capacity current of the interfacial double layer due to the periodical change of the interfacial area with its mechanical vibration. Hence, following derivation applies to this phenomenon.

An ideal polarized electrode is equivalent to a series combination of a perfect condenser and a solution resistance. The instantaneous capacitance c of this condenser is described in

$$c = K + \Delta c. \tag{1}$$

Now, we designate the alternating current in i, the alternating voltage drop at load Z in e, the equivalent series resistance in R_0 and the total *d. c.* potential difference of the condenser in E_a.

Denoting the electrical charge of the condenser in Q, we get

$$i \equiv \frac{dQ}{dt} = \frac{d}{dt}\left[c\,(E_a + e - iR_0)\right]. \tag{2}$$

Substituting the definition of (1) into (2), we get

$$i = \frac{d}{dt}\left[KE_a(1+\frac{\Delta c}{K})\ (1+\frac{e-iR_0}{E_a})\right]. \tag{3}$$

As the change of the interfacial area is very small compared with its average value,

$$\Delta c/K \ll 1,$$

and also

$$e - iR_0 \ll E_a,$$

iR_0 being positive. Hence,

$$i \equiv \frac{d}{dt}\left[K(E_a + e - iR_0)\right] + \frac{d}{dt}\left[E_a(K + \Delta c)\right].$$

Now we introduce complex representations of *a. c.* theory, as;

$$i = \sqrt{2}\ \dot{I}\ e^{j\omega t}$$

$$e = \sqrt{2}\ \dot{E}\ e^{j\omega t}$$

$$\Delta c = \sqrt{2}\ \Delta \dot{C}\ e^{j\omega t}.$$

These are substituted in the above formula and differentiation is performed, giving

$$\dot{I} = j\omega K\dot{E} - j\omega KR_0\dot{I} + j\omega K\dot{V}, \tag{4}$$

where

$$\dot{V} = E_a\cdot(\Delta\dot{C}/K)$$

is an alternating voltage which is to appear at the load terminals when the load is absent. (4) can be rewritten in

$$\dot{E} = R_0\dot{I} - \dot{V} + \dot{I}/j\omega K. \tag{5}$$

While, Ohm's law describes

$$\dot{E} = -\dot{I}Z. \tag{6}$$

Equating (5) and (6), we get

$$\dot{I} = \frac{\dot{V}}{R_0 + Z + 1/j\omega K},$$

or, when we describe Z in resistance and reactance terms, *i. e.* $Z = R + jX$, we get

$$\dot{I} = \frac{\dot{V}}{(R_0+R)+j(X-1/\omega K)} \tag{7}$$

which is the formula of U-effect II.

When the load impedance is only resistive, *i. e.* $X = 0$ and $Z = R$, the power supplied to this is

$$P = I^2R = \frac{V^2R}{(R_0+R)^2+1/\omega^2K^2} \quad ,$$

where I and V are the moduli of $\dot{I}$ and $\dot{V}$, respectively. The condition of maximum P with variable R is given by

$$\partial P/\partial R = 0,$$

or

$$R_0^2 + 1/\omega^2K^2 = R^2.$$

This is nothing but the principle of the impedance matching method for capacity measurement.

When, on the other hand, the load impedance is inductive, *i. e.* $X = \omega L$, we get

$$\dot{I} = \frac{\dot{V}}{(R_0+R)+j(\omega L-1/\omega K)}$$

This gives maximum value of I, when

$$\omega L = 1/\omega K,$$

which is the case of series resonance.

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8. Study on Surface Electricity. (XVII)

Measurement of Interfacial Capacity by Resonance Method Using U-effect

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From the theory developed in the preceding article, the circuit of U-effect II is a series combination of the double layer capacity, resistance of solution and a load impedance. Hence, we can make a resonance circuit when we use an inductance in place of the load impedance. It is clear that we get maximum current for the value of $L = L_0$, where

$$\omega L_0 = 1/\omega K$$

holds. Accordingly, we can calculate the mean value of the capacity by

$$K = 1/\omega^2 L_0.$$

Experiments were performed with an element with two Hg-N-H_2SO_4 aq. interfaces in series. The resonance curves were taken with various frequencies of vibration, and the results were